

JSC/EC5 Spacesuit Knowledge Capture (KC) Series Synopsis

This synopsis provides information about the Knowledge Capture event below.

Topic: I Didn't Know I Couldn't Do That

Date: June 2, 2016 **Time:** 1:00 p.m. – 2:00 p.m. **Location:** JSC/B9NW/R2170

This is a link to the recording of the lecture material <\\js-ea-fs-03\pd01\EC\Knowledge-Capture\FY16 Knowledge Capture\20160516 Harrison - I Didn't Know\1676 - Video>

Presenter: Dan Harrison

Synopsis: Dan Harrison will discuss overcoming institutional and cultural obstacles that he encountered during his more than 35-year career in engineering and engineering management. He will discuss why it is important to challenge the “unwritten laws” and the status quo that large organizations develop that are contrary to the end-goal of safe, affordable space exploration.

Biography: Daniel Harrison is recently retired from a 35-year career with the NASA Johnson Space Center. He earned his bachelor of science double major in physics and mathematics from Northeastern Oklahoma University in 1974. After graduation, Mr. Harrison moved to Houston, Texas where he worked for Texas Electronic Instruments for four years before joining Lockheed as an electrical engineer until 1983. He started a video game company that produced a product for making backup copies of Atari 2600-compatible games. After returning to Lockheed in 1984, he created a Bubble Mass Memory for the Space Shuttle Program. In 1988, he became a NASA civil servant and worked as an Avionics engineer, project manager, section head, and branch chief before retiring in 2014. Besides working for NASA, Mr. Harrison published several articles including one on the new Lunar Rover prototype that he managed. He also created a scan tool company for products for cars, light trucks, and heavy trucks (i.e., 18 wheelers). He currently resides in Houston, but spends considerable time at his small ranch in central Texas. He can be contacted at dharrison14@comcast.net.

EC5 Spacesuit Knowledge Capture POCs:

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Video Length (Size): 00:58:58 (2.98 GB)

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Crew and Thermal Systems Division
EC5 Space Suit and Crew Survival Systems Branch

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I Didn't Know I Couldn't Do That

June 2, 2016

Dan Harrison

Background

- From Muskogee, Oklahoma
- Citizen of Cherokee Nation
 - Cherokee lineage from my great-grandfather, Rabbits in the Snow, Copeland
- Studied vocational electronics in high school, 3 years
- Graduated from Northeastern Oklahoma University in 1974. Double major physics/math
- Worked for Lockheed at Johnson Space Center (JSC)
- Became NASA civil servant in 1988
- Retired from NASA in Jan. 2014
- Currently doing consulting and home business

First “I Didn't Know”

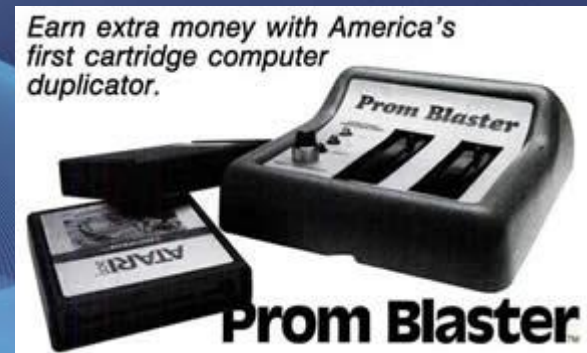
- Saw “Star Wars in” 1977.
- Knew I wanted to be a part of the Human Spaceflight Program.
- Applied to Lockheed at JSC for electrical engineer (EE) position, and was hired that day. Thrill, joy, and unbound happiness!
- Asked by an employee later how I got hired with 'only' a physics/math degree for an EE slot.
- Assumed ability was more important! Also learned about university snobbery and graduate degree snobbery. None of it bothered me too much.

Next “I Didn't Know”

- 1983, Atari 2600 video game was all the rage with kids.
- The cartridges were expensive! \$40-50 for the most popular.
- Took one apart and found it contained a single Read-Only-Memory (ROM) chip.
- Found they could be easily duplicated.
- Local business wanted to partner with me and sell cartridge duplicators. Hooked up with JS&A in Chicago, got purchase order for \$900k. Whoopeeee (almost).

Next “I Didn't Know” Cont'd

- JS&A placed full page ads in Popular Science magazine and the orders started coming in.
- Atari, finding this sort of competition not to their liking, sued JS&A.
- Atari won, judge rules cartridge cannot be destroyed electrically or mechanically, no copies allowed!!!!
- Did not know not to kick a giant in the shin. Lesson learned



Third “I Didn't Know”

Orbiter Interface Unit (OIU)



S126E005071

Orbiter Interface Unit

- Identified need for “Data Translator” for Shuttle-Space Station docking.
- Shuttle data interfaces designed in '60s and '70s. Not in current use outside NASA.
- Neither Space Shuttle Program or International Space Station Program (ISS) was accounting for this need.
- Proposed that NASA Engineering design and build this product.
- You should have heard the wails and gnashing of teeth!

Orbiter Interface Unit

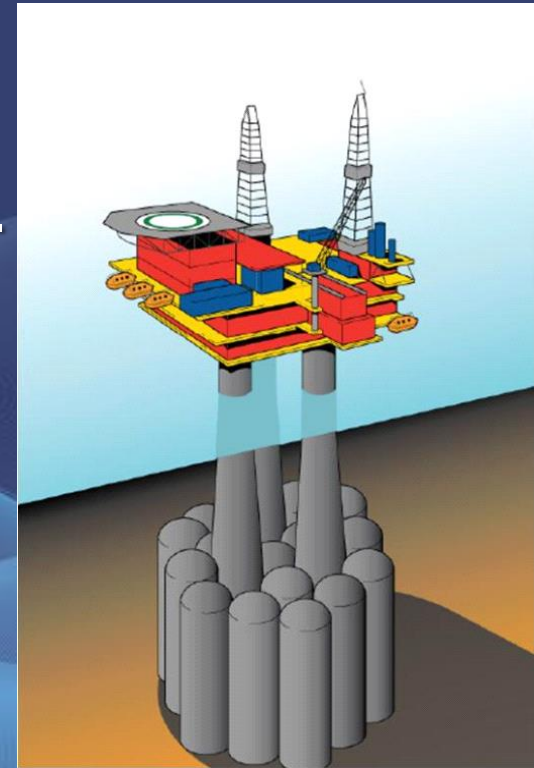
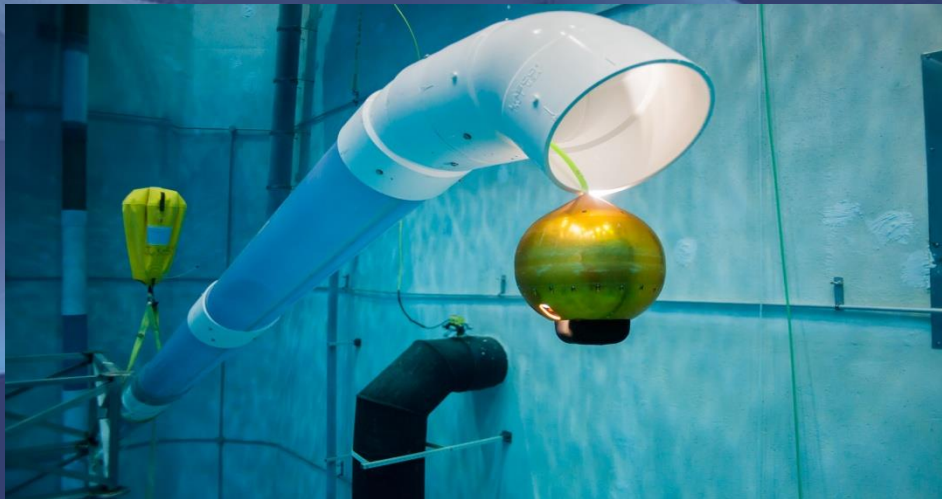
- NASA civil service does not build in-line avionics!!!
- Fortunately, a visionary manager supported my proposal.
- ISS agreed to sponsor a proposal from NASA Engineering and Boeing for the OIU
- The NASA proposal came in at \$3.2M and the Boeing bid was \$14m.
- NASA bid was accepted, rest is history!



Fourth “I Didn’t Know” Shell Inspection Sphere



- December 2012 Shell Oil presented challenge to NASA for inspection of oil container.
- Conventional method was costing over \$100m.
- Challenge accepted and we began to brainstorm possibilities.
- Decided to go with a small, 9”, sphere with sonar, camera, and sample system.





Shell Inspection Sphere



- Needed to test concept somehow in controlled environment.
- Tried to set up 9" pipe configuration and use NASA water supply. Rejected by NASA Center.
- NASA has pier on Clear Lake, saltwater, just outside our gate. Found out to get permission to set up and run test was going to require environmental impact study – that takes too long!!
- Soooooo, more than one way to skin a cat.
- Took the test setup to my house on Galveston Bay, have pier on saltwater, no permission asked for, none received, we just did it.



Shell Inspection Sphere





Shell Inspection Sphere





Shell Inspection Sphere



Summary

If you know the enemy and know yourself, you need not fear the results of a hundred battles

– Sun Tzu

Raimondi, Nick T (LARC-B704)[LAMPS]

From: Dan Harrison <[REDACTED]>
Sent: Friday, June 03, 2016 10:37 AM
To: Chullen, Cinda (JSC-EC511); Oliva, Vladenka R. (JSC-XI4)[Jacobs Technology, Inc.]
Cc: 'Lee Snapp'
Subject: Design process question yesterday

Cinda/Vladenka

I was asked a question yesterday about the importance of the design process in product development. After some thought, that question deserves a better answer than the one I gave yesterday. The student probably does not use the word 'process' as we who have been schooled (indoctrinated) in ISO9000 processes. Could you please pass along this to him. Here is my new answer:

A rigorous design process is a necessity for a good design, be it electrical, software or mechanical. Always start the design process by understanding what you are going to design. Draw a diagram with a box called "my design" in the middle, on the left you have a box called "inputs", on the right a box labeled "outputs". You first understand the nature of all the inputs to the My Design box. For example, you have 2 analog inputs and one digital serial data input. One analog input from a temp sensor and the other is a strain gauge. Pull the data sheets on both parts. Understand the voltage ranges, the impedances of the outputs, offset voltage, linearity of the signal over the full range, temp stability, max rate of change, etc. On the digital input know the logic levels, output drive, bit rate, data format (size of word, error corrections, any stop/start bits, other formats such as NRZ, embedded clocks, etc.), know the contents of messages to be received, frequency of messages, any handshaking or ACK required, error handling of incomplete messages or a message overrun.

You next document the outputs required from your design. Any displays, LED's, data outputs, analog outputs, wireless outputs, etc. Define the outputs to the same degree of understanding as you did for the inputs.

Once both inputs and outputs have been thoroughly defined and understood, begin to define all the functions of the My Design block for converting the inputs to the outputs.

I hope this helps to answer your question, you can email me at [REDACTED] if there are more questions.

Best regards
Dan Harrison